

DESCRIPTION OF A NEW HERMIT CRAB  
(FAMILY PAGURIDAE) FROM SOUTHERN  
CALIFORNIA AND MEXICO

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Several unnamed hermit crabs of genus *Pagurus* are known to occur in southern Californian waters. One of these species, which has also been collected off the outer coast of Baja California, Mexico, is described below. Its relationships are discussed, and a new species-group within the genus *Pagurus* is created for it and three closely allied forms.

In terminology and in the form of the description I follow McLaughlin (1974). Measurements in every case refer to the length of the carapace shield. The holotype and most of the paratypes are in the collections of the Allan Hancock Foundation (AHF); certain paratypes have been selected from material on loan from the National Museum of Natural History, Smithsonian Institution (USNM).

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*Pagurus spilocarpus*, new species

Figs. 1, 2

*Holotype*.—♂ (19.1 mm), *Velero III* station 1161-40, 2 mi off Belmont Pier, California, 33°43'00"N, 118°10'10"W; 23 July 1940; 13-18 m; AHF 4011.

*Paratypes*.—1♂ (17.3 mm), Zuma Beach, California; early Dec. 1970; ca. 12 m; J. Morin; AHF.—1♀ (11.2 mm), *Velero III* station 1138-40, off Redondo Beach, California; 6 May 1940; 24-40 m; AHF.—1♀ (11.3 mm), 3 juv., off Redondo Beach; May 1941; 46 m; J. Q. and T. Burch; AHF.—2♂ (15.9 and 17.0 mm), 5♀ (14.6-16.4 mm), 1 juv., same data as holotype; AHF.—1♂ (13.5 mm), 2♀ (9.8 and 14.9 mm), 3 juv., *Velero III* station 1126-40, off Huntington Beach, California; 20 April 1940; 15-27 m; AHF.—1♂ (20.2 mm), Newport Beach, California; Dec. 1936; 9-13 m; G. E. MacGinitie; USNM.—1♀ (11.9 mm), Newport Bay, California; 3 Mar. 1935; low tide; S. A. Glassell; USNM.—1♂ (14.6 mm), Newport Bay; 13 Oct. 1939; W. A. Kirk; USNM.—1♂ (14.0 mm), off Corona del Mar, California; 15 May 1937; 18 m; G. E. MacGinitie; USNM.—1♀ (11.6 mm), Burch station

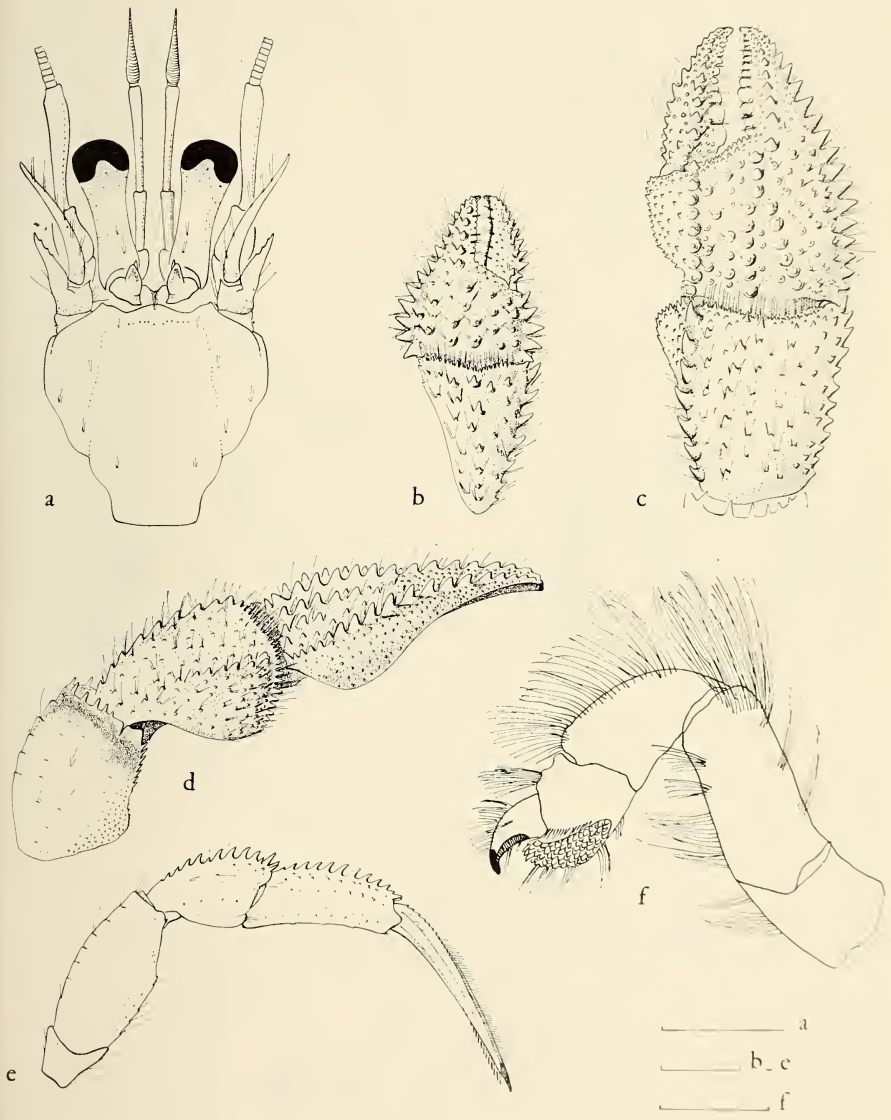
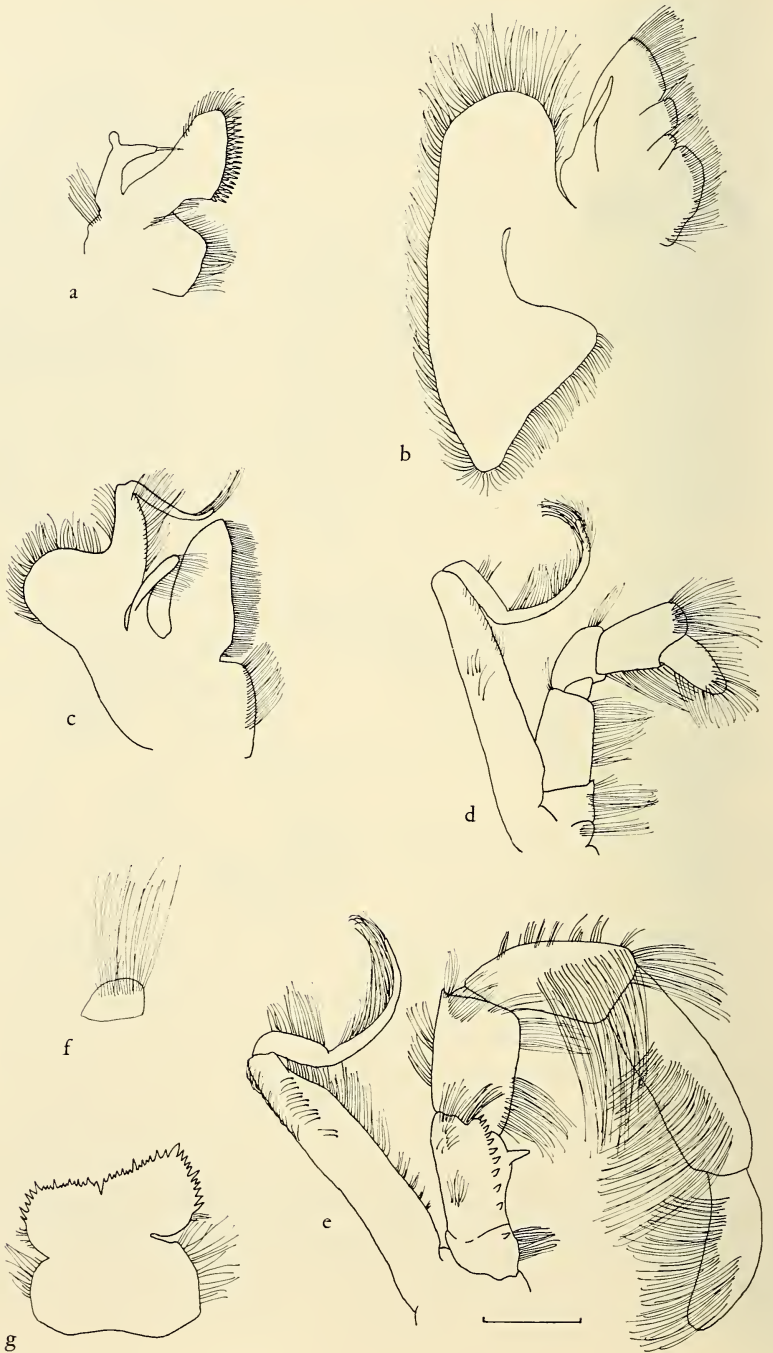


Fig. 1. *Pagurus spilocarpus*, paratype. a, Shield and anterior appendages; b, Left chela and carpus (dorsal view); c, Right chela and carpus (dorsal and partly mesial view); d, Right cheliped (lateral view); e, 2nd right pereopod (lateral view); f, 4th left pereopod (lateral view). Scales equal 10 mm (a, b-c) and 5 mm (f).



B3829, Bahía Todos Santos, Baja California; 3 July 1938; 18 m; J. Q. and T. Burch; AHF.—5♀ (10.0–14.8 mm), Scammon's entrance to Lagoon Head, Bahía Sebastián Vizcaíno, Baja California; 18 Aug. 1952; J. Littlepage; AHF.—2♂ (10.5 and 13.8 mm), offshore from Lagoon Head, Bahía Sebastián Vizcaíno; 17 Aug. 1952; J. Littlepage; AHF.—1♂ (10.5 mm), *Velero IV* station 1952-50, 6¼ mi SSW of Punta San Hipolito, Baja California; 29 Apr. 1950; 66–71 m; AHF.—2♂ (11.0 and 11.8 mm), *Velero IV* station 1953-50, 7 mi WSW of Punta Abreojos, Baja California; 29 Apr. 1950; 36–44 m; AHF.

*Diagnosis*.—Chelae with strong, conical spines on dorsal surface and on dorsomesial and dorsolateral margins. Left chela with dorsal surface flattened, dorsolateral margin strongly convex. Ambulatory legs with dactyls broad, strongly twisted, ventral surface with row of corneous spines; propodus and carpus with row of spines on dorsal surface. Telson with posterior lobes asymmetrical, subquadrate; terminal and lateral margins with narrow, close-set, strong spines.

*Description*.—Shield approximately as broad as long; anterolateral margins sloping or slightly terraced; anterior margin between rostrum and lateral projections concave; posterior margin truncate; dorsal surface generally smooth, with scattered tufts of moderately long setae; anterolateral angle produced, blunt. Rostrum about equalling or slightly falling short of lateral projections, obtusely triangular or broadly rounded. Lateral projections well developed, broadly rounded or obtusely triangular, each with terminal spinule.

Ocular peduncles long, moderately stout,  $\frac{3}{5}$  to  $\frac{7}{10}$  length of shield; somewhat inflated basally, corneal region dilated; dorsomesial face with longitudinal row of short setae. Ocular acicles large, subtriangular, mesial margin convex or nearly straight, lateral margin convex, dorsal surface concave; terminating subacutely, with strong submarginal spine and with setae on dorsal surface; separated basally by approximately basal width of one acicle.

Antennular peduncles long, exceeding ocular peduncles by  $\frac{2}{3}$  to entire length of ultimate segment; basal segment with spinule on distolateral margin.

Antennal peduncles long, exceeding ocular peduncles by  $\frac{1}{2}$  to  $\frac{2}{3}$  length of ultimate segment; with supernumerary segmentation. Fifth segment unarmed, lightly setose. Fourth segment with tufts of short setae. Third segment with ventromesial distal angle produced, terminating in short spine, with tufts of long setae. Second segment with dorsolateral distal

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Fig. 2. *Pagurus spilocarpus*, paratype. a–e, Mouthparts (left, internal view): a, Maxillule; b, Maxilla; c, 1st maxilliped; d, 2nd maxilliped; e, 3d maxilliped. f, Sternite of 3d pereopods; g, Telson. Scale equals 3 mm.

angle produced, terminating in simple or bifid spine, mesial margin with 6-9 spinules, lateral margin unarmed; dorsomesial distal angle with strong spine, mesial margin with long setae. First segment with lateral margin unarmed or with small spinule; ventral margin produced, unarmed. Antennal acicle as long as, or a little shorter than ocular peduncles; arcuate, subtriangular, with dorsal surface flattened; mesial and lateral margins unarmed, mesial margin with long setae. Antennal flagella long, overreaching right cheliped, articles with extremely short setae.

Mandible without distinctive characters. Maxillule with proximal endite subquadrate, internal lobe of endopodite well developed and with one bristle, external lobe produced, ovoid, not recurved. Maxilla with endopodite inflated basally, tapering to tip, exceeding scaphognathite in distal extension. First maxilliped with endopodite about half length of exopodite; basal portion of exopodite very strongly inflated to form semicircular lobe. Second maxilliped with basis-ischium fusion incomplete. Third maxilliped with basis-ischium fusion incomplete; basis with one tooth; ischium with crista dentata moderately well developed, with one (occasionally 2) accessory teeth; merus with small spine at dorsodistal margin; carpus unarmed. Sternite of  $m_{x3}$  unarmed, or with spinule on one or both sides of midline; anterior margin with long setae.

Right cheliped considerably larger than left; with moderately long, fine setae dorsally. Dactyl equalling, or slightly longer than, length of palm, mesial margin curved; cutting edge with strong calcareous teeth proximally, small calcareous teeth distally; terminating in strong calcareous tooth, slightly overlapped by fixed finger; mesial margin with row of conical spines, decreasing in size distally; dorsal surface with median longitudinal row of conical spines, and with low tubercles toward cutting edge; mesial face between spine rows closely set with tubercles, the more proximal ones produced into small spines; ventral surface with close-set tubercles, and with row of a few spines proximally at ventromesial margin. Palm  $\frac{1}{2}$  length of carpus; lateral margin curved; dorsal surface with irregular rows of high, conical spines, 2 median rows of somewhat larger spines forming inverted V, from its apex a row of enlarged spines extending to tip of fixed finger; dorsomesial margin with row of enlarged spines; dorsolateral margin with row of strong spines, increasing in size on fixed finger; mesial face with close-set, pointed tubercles, these becoming flattened on ventral surface; cutting edge of fixed finger with calcareous teeth, decreasing in size distally. Carpus equalling, or slightly longer than length of merus; dorsal surface convex, with short spines tending to become very small medially; distal margin with row of small spines, dorsomesial margin with row of strong spines increasing in size distally; mesial and lateral faces with close-set tubercles and moderately long setae, distal margins each with row of spines or spinose tubercles; ventral surface tuberculate. Merus sub-

triangular; dorsal surface with transverse multidenticulate ridges, distal margin with row of strong spines decreasing in size laterally and mesially; lateral and mesial faces nearly smooth, granulate toward ventral margins; ventrolateral and ventromesial margins each with row of small spines or spinose tubercles; ventral surface tuberculate. Ischium with row of small denticles or tubercles and tufts of moderately long setae on ventromesial margin.

Left cheliped moderately short, sometimes slightly overreaching base of dactyl of right cheliped. Chela subtriangular. Dactyl about  $1\frac{1}{2}$  times length of palm; cutting edge with row of small corneous teeth; terminating in small corneous claw, overlapped and overreached by fixed finger; dorsomesial margin with double row of strong spines and with tufts of long setae, dorsal surface with flattened granules; mesial face smooth, with long tufts of setae; ventral face smooth or with small pointed tubercles, and with long tufts of setae. Palm slightly more than half length of carpus; dorsal surface flattened, horizontal, with longitudinal rows of conical spines interspersed with small pointed granules and tufts of moderately long setae, one row of spines extending to tip of fixed finger; dorsolateral margin slightly raised, strongly convex, with row of strong spines decreasing in size on fixed finger; dorsomesial margin somewhat expanded, with row of large spines and with tufts of long setae; mesial face with a few tubercles and with tufts of setae; ventral and lateral surfaces with pointed tubercles of various sizes and with tufts of setae; cutting edge of fixed finger with small calcareous teeth, tip with corneous claw. Carpus subtriangular, slightly exceeding merus in length; dorsal surface oblique, with longitudinal rows of strong spines and tufts of moderately long setae, distal margin with 2 or 3 rows of small spines, dorsomesial margin with row of strong spines increasing in size distally; mesial and lateral faces with scattered tubercles and tufts of moderately long setae, distal margins each with row of small teeth or tubercles; ventral surface tuberculate. Merus subtriangular; dorsal surface with transverse, multidenticulate ridges and tufts of setae; distal margin with 1 or 2 spines; lateral face nearly smooth, ventrolateral margin with 3 or 4 strong spines distally; mesial face nearly smooth except for several groups of pointed tubercles near proximal end of ventromesial margin; ventromesial margin with row of pointed tubercles and long setae, similar tubercles and setae covering distal part of ventral surface. Ischium with row of strong denticles or pointed tubercles and tufts of long setae on ventromesial margin.

Second pereopods long, frequently reaching or slightly overreaching distal end of right cheliped. Dactyl long,  $1\frac{1}{4}$  to 2 times length of propodus; in lateral view, curved ventrally; in dorsal view, twisted; terminating in strong corneous claw; row of calcareous spinules on proximal half of dorsal surface, this surface with fringe of relatively short setae; mesial face with median longitudinal sulcus, row of corneous spinules close to dorsal margin.

and a few scattered corneous spinules near ventral margin; lateral surface with median longitudinal sulcus along proximal  $\frac{2}{3}$  to  $\frac{3}{4}$  of segment; ventral margin with row of corneous spines, increasing in size distally. Propodus equalling or slightly exceeding length of carpus; dorsal and ventral margins somewhat converging distally; dorsal surface with row of moderately strong spines; mesial surface nearly smooth, a few low pointed tubercles dorsally and spine on dorsal part of distal margin; lateral surface nearly smooth, a few low tubercles and tufts of short setae dorsally; ventral surface with a few scattered, minute corneous spinules. Carpus  $\frac{3}{5}$  to  $\frac{7}{10}$  length of merus; dorsal surface with row of moderately strong spines, increasing in size distally; mesial face nearly smooth, with a few pointed granules near spine row; lateral face nearly smooth, with scattered tufts of short setae and a few rounded granules near spine row; ventral surface smooth. Merus laterally compressed; dorsal margin with row of pointed granules and tufts of moderately short setae, lateral and mesial faces smooth; ventral margin with row of small pointed tubercles, ventrolateral margin with strong spine distally. Ischium with a few small pointed tubercles and tufts of moderately long setae on ventral margin.

Third pereopods approximately as long as second, reaching or slightly overreaching distal end of right cheliped. Dactyl as in  $P_2$ . Propodus as in  $P_2$ , but spines on dorsal surface smaller and distal margin of mesial surface unarmed. Carpus equalling length of merus; dorsal surface with row of spines, smaller than those of  $P_2$ , increasing in size distally; lateral face nearly smooth, with patch of setae dorsodistally; mesial and ventral surfaces smooth. Merus laterally compressed; dorsal margin nearly smooth, with tufts of moderately short setae; lateral and mesial faces smooth; ventral margin with a few wide-set, small pointed tubercles, ventrolateral margin unarmed distally. Ischium unarmed ventrally.

Fourth pereopods without preungual process on lateral face of dactyl; propodal rasp well developed.

Fifth pereopods typical of *Pagurus*.

Sternite of third pereopods rounded, anterior margin unarmed but with row of long setae.

Pleopods of male unpaired,  $pl_3$ - $pl_5$  with exopodites moderately well developed; endopodites reduced. Pleopods of female unpaired,  $pl_2$ - $pl_4$  with both rami well developed;  $pl_5$  with exopodite moderately well developed, endopodite reduced.

Telson with posterior lobes asymmetrical, left larger than right; subquadrate; separated by narrow median cleft; both terminal and both lateral margins with narrow, close-set, strong spines; anterior lobes unarmed, lateral margins with setae.

*Color in life*.—Shield and ocular acicles tan, with small, irregularly ar-

ranged, reddish-brown flecks. Ocular peduncles white on dorsal and mesial surfaces, reddish-brown on lateral and ventral surfaces; with touches of reddish-brown dorsally at base of peduncle and adjacent to cornea; cornea greenish-black. Antennular peduncles with proximal segments white or pale gray; ultimate segment and flagellum red or reddish-brown. Antennal peduncles with proximal segments white, purplish-brown laterally; ultimate segment with sharp line of reddish-brown on lateral and mesial margins; acicle white; flagellum reddish on lateral and tan on mesial side of each article.

Chelipeds with ground color tan; spines white at base, purple at tips. Fingers with row of blue tubercles next to cutting edge; to outside of these a narrow, bluish- or purplish-white longitudinal line. Carpus with large, dark purple spot proximally on dorsal surface. Merus with triangular, reddish-brown area dorsodistally; on lateral face, a narrow band of reddish-brown close to distal margin; distal spines reddish-brown with white tips. Ambulatory legs tan. Carpus with large reddish-brown blotch proximally on lateral surface. Merus with broad reddish-brown band at distal end.

*Etymology*.—From Greek “spilos,” a spot or stain, and “carpus,” in reference to the distinctive purple mark on the carpal segment of the chelipeds.

*Remarks*.—Available data suggest that this species usually occurs on a sandy substrate. Oviparous females (11.2–14.9 mm) were collected in April, May, July, and August.

*Pagurus spilocarpus* superficially resembles another Californian species, *P. armatus* (Dana). In *P. armatus*, as in the new species, there are spines on the dorsal surface and margins of the chelae; the dorsal surface of the left chela is flattened; the dactyls of the walking legs are twisted, with a ventral row of corneous spines; and there is a dorsal row of spines on the propodus and carpus of the walking legs. However, *P. armatus* differs in a number of characters, especially in the structure of the ocular peduncles and acicles, left chela, telson, and mouthparts (cf. McLaughlin, 1974: Figs. 13, 14).

In the eastern Pacific, *Pagurus spilocarpus* is most closely related to *P. smithi* (Benedict). *P. smithi* appears to be restricted to northern Mexico; its known range (based on published records and a long series of specimens in the collections of the Allan Hancock Foundation) includes the entire Gulf of California and the outer coast of Baja California as far north as Islas San Benito. This species has not yet been illustrated, but it is easily recognizable from the original description (Benedict, 1892: 4). Among the characters which it shares with *P. spilocarpus* are the following: The left chela is flat, horizontal, and strongly convex laterally; the telson is asymmetrical, with the posterior lobes subquadrate and armed on both



terminal and lateral margins; and the dactyls of the walking legs are twisted, with a ventral row of corneous spines. There is also a striking similarity in the structure of the mouthparts.

These characters are also present in two species from the Atlantic coast of North America, *Pagurus pollicaris* Say and *P. impressus* (Benedict) (Williams, 1965: 128, Fig. 103 and 129, Fig. 104). The similarities of these 4 species, and the combined characters which set them apart from other American *Pagurus*, appear to justify their inclusion in a distinct species-group, similar to the 8 groups already recognized and characterized by McLaughlin (1974, 1975) and the one tentatively established by Haig (1974). This may be called the "*smithi*" group and defined as follows:

Anterior margin with rostrum produced, obtusely triangular or broadly rounded. Ocular peduncles stout or moderately stout, corneae dilated. Ocular acicles subtriangular, dorsal surface concave.

Chelipeds grossly unequal; left chela with dorsal surface flattened, lateral margin strongly convex. Second and third pereopods elongate; dactyls long, broad, twisted, ventral margins with strong, corneous spines. Fourth pereopods without preungual process; propodal rasp well developed.

Males with 3 unpaired pleopods; females with 4 unpaired pleopods.

Telson with posterior lobes asymmetrical, left larger than right; generally subquadrate; terminal and lateral margins with close-set spines.

Maxillule with proximal endite subquadrate; endopodite with external lobe produced, ovoid, not recurved. First maxilliped with basal segment of exopodite very strongly inflated, forming semicircular lobe. Second maxilliped with basis-ischium fusion incomplete. Third maxilliped with 1 or 2 accessory teeth on moderately well developed crista dentata; merus with spine at dorsodistal margin.

This group has several characters in common with the "*bernhardus*" group (McLaughlin, 1974: 44), particularly the flattened dorsal surface of the left chela and the form of the rostrum, dactyls of pereopods 2 and 3, propodus and dactyl of pereopod 4, and second and third maxillipeds. In members of the "*bernhardus*" group, on the other hand, the ocular acicles are subovate instead of triangular; the lateral margin of the left chela is not strongly convex; the posterior lobes of the telson are subtriangular instead of subquadrate, and are unarmed on their lateral margins; on the endopodite of the maxillule, the external lobe is recurved and without the distinctive ovoid shape found in the "*smithi*" group; the basal segment of the exopodite of the first maxilliped is inflated, but much less so than in the "*smithi*" group and not in the form of a semicircular lobe.

#### Literature Cited

- Benedict, J. E. 1892. Preliminary descriptions of thirty-seven new species of hermit crabs of the genus *Eupagurus* in the U.S. National Museum. Proc. U.S. Nat. Mus. 15:1-26.

- Haig, J. 1974. Two new species of *Pagurus* from deep water off Peru and Chile (Decapoda, Anomura, Paguridae). *Crustaceana* 27:119-130.
- McLaughlin, P. A. 1974. The hermit crabs (Crustacea Decapoda, Paguridea) of northwestern North America. *Zool. Verhand. Leiden* 130:396 pp., 1 pl.
- . 1975. Biological results of the University of Miami deep-sea expeditions. 114. On the identity of *Pagurus brevidactylus* (Stimpson) (Decapoda: Paguridae), with the description of a new species of *Pagurus* from the western Atlantic. *Bull. Mar. Sci.* 25:359-376.
- Williams, A. B. 1965. Marine decapod crustaceans of the Carolinas. U.S. Fish and Wildlife Service, Fishery Bull. 65(1):xi + 298 pp.

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